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Approved for use through10/31/2002. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

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TITLE OF THE INVENTION (500 characters max)

Wireless Network Signaling For Support Of PTT

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

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ENCLOSED APPLICATION PARTS *(check all that apply)*

[x] Specification *Number of Pages* 9
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[X] Other (specify) return postcard
[ ] Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

[ ] Applicant claims small entity status. See 37 CFR 1.27.
[ ] A check or money order is enclosed to cover the filing fees
[x] The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 50-0210
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[x] No.
[ ] Yes, the name of the U.S. Government agency and the Government contract number are: _____

Respectfully submitted,

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Date 02/24/20

REGISTRATION NO. *(if appropriate)* 25,231

Docket Number: 1681RRUS01P

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Additional Page

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Docket Number	16812RRUS01P

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Provisional Patent Application

Title:

Wireless Network Signaling For Support Of PTT

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Submitted on: February 24, 2004

Introduction:

The proposed invention describes a new interface between the BS (Base Station) and the PDSN (Packet Data Service Node) also know as A10 interface in the CDMA (Code Division Multiple Access) standards such as 3GPP2 (3rd Generation Partnership Project), TIA (Telecommunications Industry Association) and IEFT (Internet Engineering Task Force).

Currently, while setting up a data call (also known as Service Option 33) a single A10 interface between the PCF (Packet Control Function) of the BS and the PDSN is set up for transporting the user payloads – typically IP (Internet Protocol) packets that are used in the Internet. This A10 interface is set up by sending the signaling messages between the PCF and PDSN. The interface used for transporting the control plane (i.e., the signaling messages) is known as A11[1]. The invention provides the following improvement over the existing protocols.

1. Differentiate the content of the A10 interface (between PCU and PDSN) based on the packet application – such as PTT (Push To Talk) - to be transported across this interface. That is done by adding an extension in the A11-Registration Request message that is sent from the PCF to the PDSN informing of the specialized application (such as PTT). The VSE (Vendor Specific Extension) as specified by [2] can be used to add this extension to A11-Registration Request message.

2. Additionally, this invention provides a way of transporting both signaling messages and user payloads across a single A10 interface. One of the implementation of this method may use a single A10 interface to channel the SIP (Session Initiated Protocol) based signaling messages for PTT as well as the VoIP (Voice over IP) based voice traffic for PTT. This is done by adding a flag (typically one toggle bit) in the GRE (Generic Routing Encapsulation) header to differentiate the specific application signaling (such as PTT SIP messages) from the user payload (such as the PTT VoIP traffic).

3. This invention uses RLP (Radio Link Protocol) to send the application specific messages (such as PTT) between the MS (Mobile Station) and the BS. One implementation of this of this may be sending the PTT signaling messages (such as SIP messages for floor control) as PTT BLOB (PTT BLock Of Bits) between the MS and BS. This is done by either the MS or the BS discovering that the user is running a specific application (such as PTT) and then sending the signaling messages over the RLP (such as PTT BLOB) with a specific flag to designate these bits as specialized message.

4. This invention also provides a way for using the SDB (Short Data Burst) for delivering application specific signaling messages (such as SIP messages for PTT) to MS while they are dormant. This is performed when the PCF receives a signaling message destined for a dormant MS and it (the PCF) discovers that the

MS is running a specific application (such as PTT) and decides to deliver the signaling message directly to the MS using the SDB feature.

Detailed Description of the Invention:

The following section provides a detailed description of the invention.

Combined Signal and Bearer A10:

The following figure (Figure 1) shows the basic sequences for establishing the proposed A10 interface to be used for a specific packet based application (such as PTT). Here is the description of the sequences.

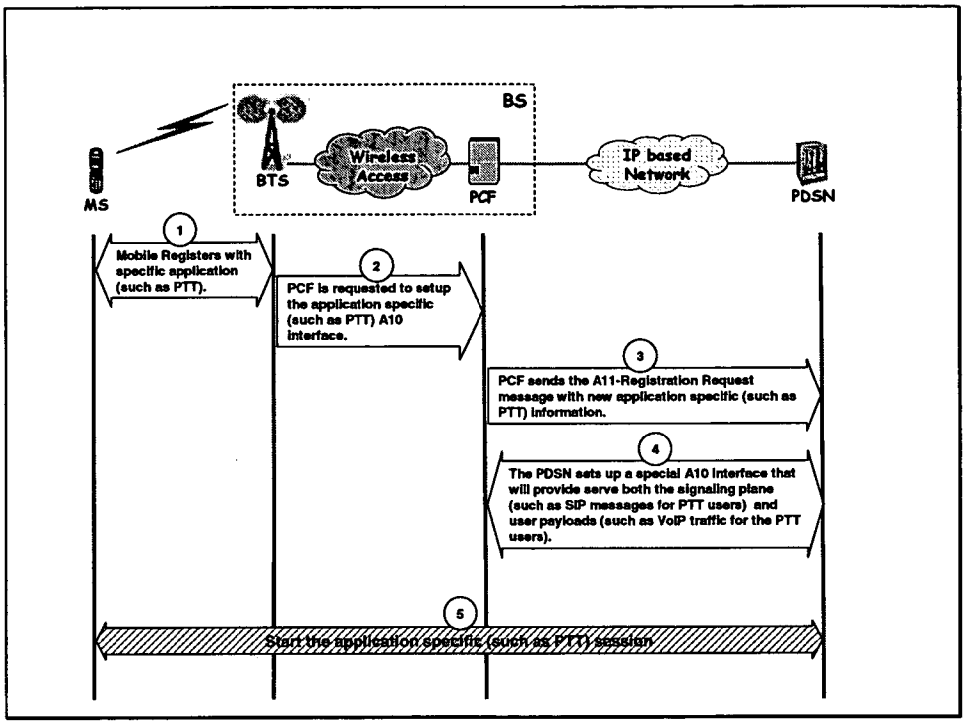

Figure 1: Setting up a Specialized A10 Interface between the PCF and the PDSN

1. The MS initiates the Registration process for a specific packet based application such as PTT.
2. The PCF is requested to setup the proposed A10 interface between the PCF and the PDSN.
3. The PCF sends an A11-Registration message to the PDSN indicating that this requested A10 interface will have different characteristics so that both signaling messages (such as SIP messages for PTT) and bearer plane (such as VoIP based voice traffic for PTT) for serving this special packet based application (such as PTT).
4. The PCF and the PDSN set up a A10 interface for this special application (such as PTT) so that both control plane (such as SIP message for PTT) and the bearer

plane (such as VoIP traffic for PTT) related to this application can be channeled through this A10 interface.

5. The MS can now initiate the new packet based application (such as PTT) across the wireless access network.

Flow of Information in the Reverse (MS to BS) Direction:

Figure 2 below shows the flow of information in the reverse direction (from the MS to the BS) using the proposed method. Here is the description of the sequences depicted in the figure.

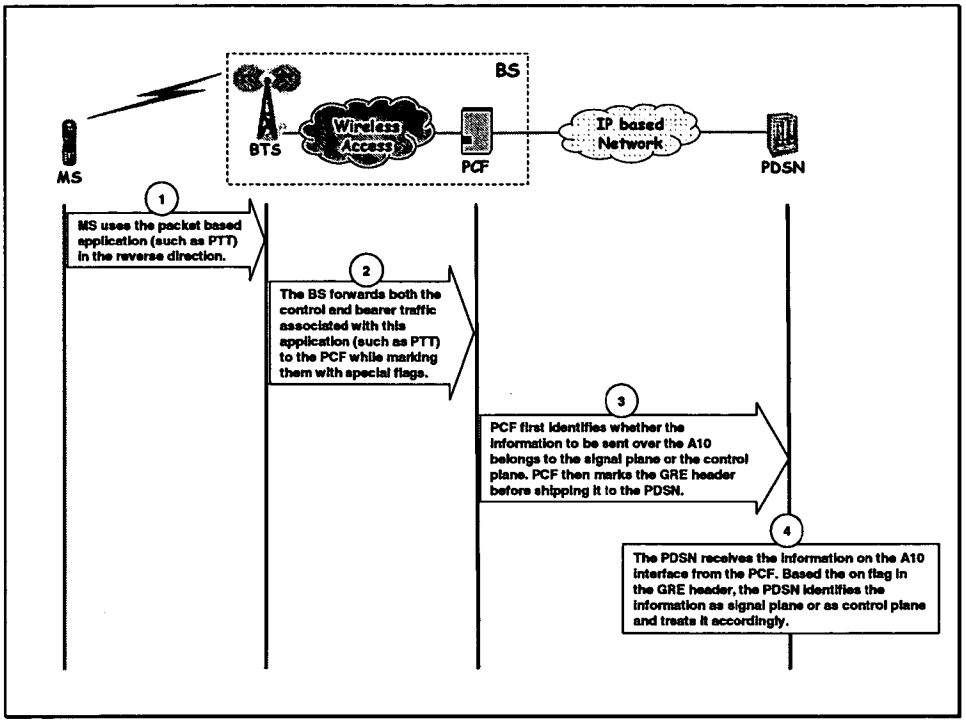

Figure 2: Information Flow in the Reverse Direction (from MS to the BS)

1. MS starts to send data packets (either signal or bearer) associated with a specific packet-based application (such as PTT) in the reverse direction, that is, towards the BS.

2. Since the packets received by the BS (from the MS) are all associated with a special packet-based application (such as PTT), the BS will mark the signaling and bearer packets separately (so that they can easily be identified) before shipping it to the PCF.

3. The PCF receives the packets associated with the special application (such as PTT) from the BS. The PCF will then include a flag in the GRE header to distinguish the signal plane (such as SIP messages for PTT) from the control plane (such as VoIP traffic for PTT) and ship it to the PDSN.

4. The PDSN receives the packets associated with the special application (such as PTT) from the PCF. The PDSN will then process the signaling plane (such as SIP messages for the PTT) and bearer plane (such as VoIP traffic for PTT) accordingly.

Flow of Information in the Reverse Direction:

Figure 3 below shows the flow of information in the forward direction (from the BS to the MS) using the proposed method. Here is the description of the sequences depicted in the figure.

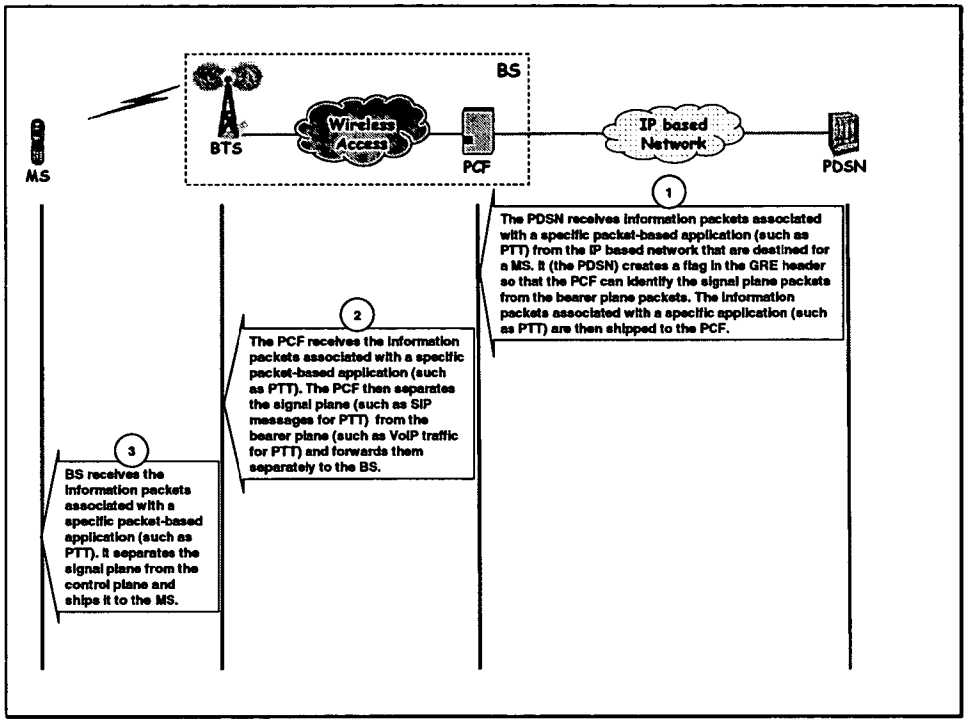

Figure 3: Information Flow in the Forward Direction (from BS to the MS)

1. The IP-based packet network sends information packets associated with a specific packet-based application (such as PTT) that are destined for an MS. The PDSN has to perform internal processing and peek into the contents of the packet in order to determine how to mark it in the GRE header. The PDSN will then include a flag in the GRE header so that the PCF can distinguish the signal plane (such as SIP messages for PTT) from the control plane (such as VoIP traffic for PTT). The information packets associated with a specific application (such as PTT) are then shipped to the PCF.

2. The PCF receives the information packets from the PDSN that are associated with a specific packet-based application (such as PTT). The PCF first looks at the flag in the GRE header (as inserted by the PDSN) to determine if the information packets are signaling packets (such as SIP messages for PTT) or the bearer

packets (such as VoIP traffic for PTT). The PCF then separates the signaling packets from the bearer packets and sends them to the BS.

3. The BS receives the information packets associated with a specific packet-based application (such as PTT) from the PCF. It (the BS) first separates the signaling plane (such as SIP messages for PTT) and the bearer plane (such as VoIP traffic for PTT) and then forwards them to the MS.

Changes to A11 Messages:

The A10 setup and/or update related messages - A11-Registration Request, A11-Registration Update and A11-Session Update messages [1] - will change to reflect the proposed A10 interface that is capable of channeling both signal packets (such as SIP messages for PTT) and bearer packets (such as VoIP traffic for PTT) as mentioned above. Figure 4 below shows an example of implementing this into these A10 setup/update messages.

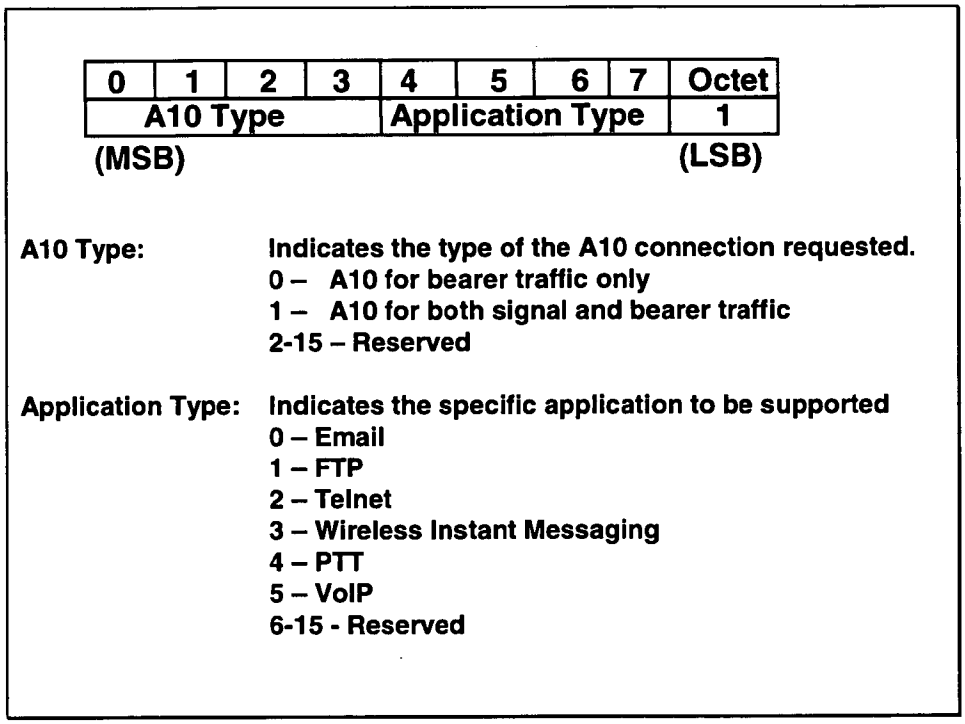

Figure 4: A Long Example of Modified A10 Setup/Update Messages

As shown in this figure (Figure 4), two more fields are added to convey the information that a specialized A10 interface for a specific application (such as PTT).

Another example of modifying the A10 setup/update (A11-Registration Request, A11-Registration Update and A11-Session Update) messages may be as follows (Figure 5).

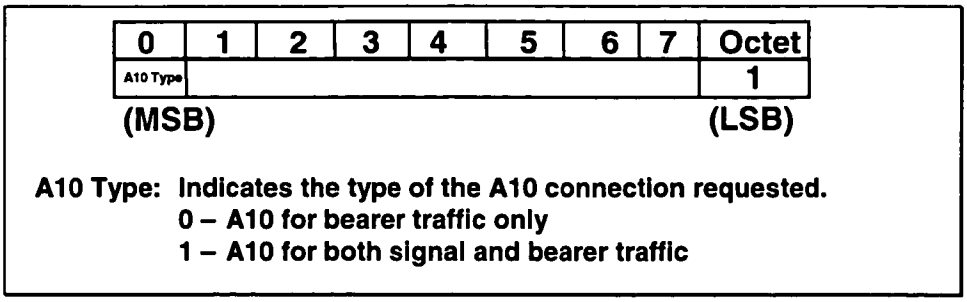

Figure 5: A Short Example of Modified A10 Messages

As shown in Figure 5, only one bit is used to differentiate between the current A10 and the proposed A10 interfaces.

The PDSN may perform the following actions upon receiving any of these messages (A11-Registration Request, A11-Registration Update and A11-Session Update) with the modifications suggested above (Figure 4 and Figure 5):

1. Upon receiving the A11-Registration message, the PDSN may set up the proposed A10 interface (as mentioned above) with the PCF.
2. Upon receiving the A11-Registration Update message, the PDSN may update the necessary information to continue to maintain the proposed A10 interface (as mentioned above) wit the PCF.
3. Upon receiving the A11-Session Update message, the PDSN may update the session associated with the propose A10 interface (as mentioned above) with the PCF.
4. The PDSN may create either an A10 interface as described in [1] or may create an A10 interface as proposed by this invention using any combination of A10 Type and Application Type fields received in these messages.

Modifications to the GRE Header:

The invention uses a special flag in the GRE header [4] as part of the proposed A10 interface to transport information packets between the PDSN and the PCF. The objective of separating the signaling packets and the bearer packets are as follows.

- Real time applications (such as VoIP and PTT) may not require the RLP (Radio Link Protocol) retransmission service as proposed by CDMA standards (such as TIA/EIA/IS-707). Taking away the RLP, however, may hinder the guaranteed delivery aspect of signaling messages and may significantly degrade the quality of the service. To ensure that the signaling packets are not lost, the proposed A10 interface suggests separating the signaling packets so that they can be treated with higher priority than that of the bearer packets.

- Since a very small portion of the call/session holding time consists of signaling packets (such as SIP message for PTT), the chances of degrading the media quality (such as VoIP traffic for PTT) is fairly insignificant by treating the signaling packets (such as SIP messages for PTT) with higher priority.

Any of the reserved bits of the GRE header (as describe in [4])can be used to convey the payload type. The following is an example of implementation of this flag.

1. 0 = Payload of the GRE packet is carrying signal packets (such as SIP messages for PTT)
2. 1 = Payload of the GRE packet is carrying bearer packets (such as VoIP traffic for PTT)

However, the Protocol Type field of the GRE header [4] may also be used to implement the above flag in a similar manner.

Use of SDB for Dormant MS:

The invention proposes that the BS will use the SDB for delivering information packets associated with a specific application (such as PTT) to any MS that may have gone dormant [1], [3] .

Figure 6 below illustrates an example of how the SDB is used in the proposed invention. The following is a brief description of the sequences of this procedure.

1. The PDSN processes the information packets associated with a specific application (such as PTT) received from the IP based networks destined for an MS currently served by this wireless access network. The PDSN. The information packets are then forwarded to the PCF using the proposed A10 interface as shown in earlier sections.

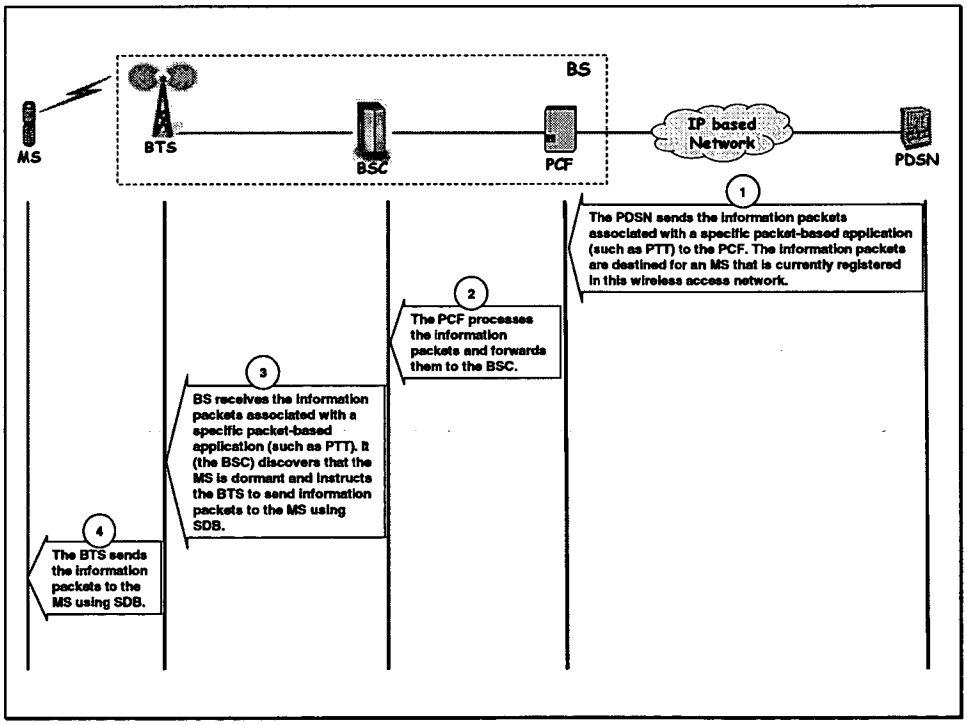

Figure 6: Use of SDB for Delivering Information Packets

2. The PCF processes the information packets associated with a specific application (such as PTT) and forwards them to the BSC (Base Station Controller).

3. The BSC receives the information packets associated with a specific application (such as PTT) and identifies the destined MS's location, that is, the location of the BTS (Base Transceiver Station) currently serving the MS. The BSC also discovers that the MS is currently in a dormant state. The BSC then instructs the appropriate BTS to deliver the information packets to the MS using SDB.

4. The BTS receives the information packets destined for the MS. The BTS then delivers the information packets to the MS using the SDB.

References:

[1] Interoperability Specification (IOS) for cdma2000 Access Network Interfaces Part 7—A10 and A11 Interfaces, 3G-IOSv4.3, 3GPP2 A.S0017-A, Version 2.0.1, http://www.3gpp2.org/Public_html/specs/A.S0017-A_v2.0.1_121903.pdf, July 2003.

[2] Dommety, G. and Leung, K. RFC 3025, Mobile IP Vendor/Organization-Specific Extensions, IETF, http://rfc.sunsite.dk/rfc/rfc3025.html, February 2001.

[3] Interoperability Specification (IOS) for High Rate Packet Data (HRPD) Access Network Interfaces 3 Revision 0, 3GPP2 A.S0008-0 v3. 0, http://www.3gpp2.org/Public_html/specs/A.S0008-0_v3.0.pdf, May 2003.

[4] Farinacci, et al., RFC 2784, Generic Routing Encapsulation (GRE), Internet Engineering Task Force, March 2000.